REMARKS

By this amendment, the specification has been editorially amended and claim 1 has been amended in the application. Currently, claims 1-21 are pending in the application.

The indication that claims 20-21 are allowed is noted with appreciation. Also, the indication that claims 2 and 7 contain allowable subject matter is noted with appreciation.

The specification was objected to because a typographical error was found in the specification. By this amendment, the term "vale Xj" on page 12, line 16 of the specification has been amended to "value Xj". Therefore, it is respectfully submitted that this objection has been overcome and should be withdrawn.

Claim 1 was rejected under 35 USC 103(a) as being obvious over Kim (U.S. Patent No. 7,006,577) in view of Nomura (U.S. Patent No. 6,731,702).

This rejection is respectfully traversed in view of the remarks below.

The present invention relates to a null symbol detection device used for receivers in a digital broadcasting system in which a null symbol repetition period or a null symbol width is

different depending on transmission modes (see page 1, lines 5-9 of the specification).

A null symbol detection device 10A illustrated in Fig. 2 is configured so as to include an amplitude detector 11, a synchronous addition buffer group 12, a transmission mode determination processor 13A, a sample clock generator 18 and a null position detector 19. The transmission mode determination processor 13A has a moving average processing unit 14, a correction processing unit 15 and a transmission mode determining unit 16 (see page 10, lines 7-14 of the specification).

The transmission mode determination processor 13A performs a moving average operation upon all of synchronous addition data rows stored in the respective synchronous addition buffers of the synchronous addition buffer group 12, and detects the minimum value of the moving average operation and the address of a synchronous addition buffer providing this minimum value. On the basis of the minimum value of the moving average operation and the address of the synchronous addition buffer, a transmission mode is determined.

The moving average processing unit 14 calculates a moving average operation value (also referred to as the moving average)

of all synchronous addition data stored in the synchronous addition buffer group 12, i.e., the first to third synchronous addition buffers 12a to 12c, and outputs the minimum value of the moving average operation and the address of a synchronous addition buffer providing the minimum value.

The null position detector 19 detects, as a null symbol start position, the start address providing the minimum value of the moving average operation corresponding to the transmission mode that was determined in the transmission mode determining unit 16. Specifically, the null position detector 19 outputs, for the start address position, a pulse which is synchronous with the sample clock generator 18. Thus, the null position detector 19 detects the null position (see page 13, lines 16-24 of the specification).

Independent claim 1 recites a null symbol detection device including:

"a transmission mode determination processor operable for performing a moving average operation upon all synchronous addition data rows stored in said at least one of synchronous addition buffers of said synchronous addition buffer group, and for determining a transmission mode by detecting, with respect to

a transmission mode to be received, a minimum value of the moving average operation and an address of said at least one synchronous addition buffers providing the minimum value; and

a null position detector operable for detecting, in accordance with a transmission mode determined in said transmission mode determination processor, a null symbol position from the address providing the minimum value of the moving average operation, and for generating a synchronous pulse at a start point of the null symbol position".

These features are not shown or suggested by Kim, Nomura or any combination of these references. Specifically, none of these references have a transmission mode detection processor using a moving average operation and determining a transmission mode by a minimum value of the moving average. Also, none of these references have a null position detector for detecting a null symbol position based on the transmission mode determined by the mode determination processor.

Kim relates to an apparatus and method for detecting a transmission mode in a digital audio receiver adopting an orthogonal frequency division multiplexing (OFDM) scheme for broadcasting, and more particularly, to an apparatus and method

for detecting each transmission mode by detecting the starting and ending points of an OFDM signal (see col. 1, lines 10-16).

Kim discloses that in FIG. 4, the mode detection apparatus includes an analog-to-digital converter (ADC) 210, a square value calculation unit 230, a null symbol length calculation unit 250 and a mode determination unit 270 (see col. 5, lines 9-12).

Kim also discloses that the null symbol location detector 256 determines the starting point of a null symbol by detecting a minimum square value output from the sum of squares ratio calculator 254 for the first search period, and determines the end point of the null symbol by detecting a maximum mean square value output from the sum of squares ratio calculator 254 for the second search period. Then, the null symbol location detector 256 outputs a search period control signal for changing one of the first and second search periods to the other search period.

Although the starting point of a null symbol a minimum mean square value output from the sum of squares ratio calculator 254 for the first search period to be has been determined with the minimum mean square value, if the sum of squares ratio calculator 254 calculates the mean square value by dividing m2(k) by m1(k), the starting and end points of a null symbol may be determined

with the maximum and minimum mean square values, respectively (see col. 5, lines 46-64).

Kim also discloses that the null symbol length of each sample is calculated by detecting the starting and end points Nstart and Nend of the null symbol of each sample using the square values calculated in step S130 (step S150). In step 170, the null symbol length calculated in step S150 is compared with predetermined range of the null symbol length for each mode, thereby determining a transmission mode (see col. 6, lines 20-28).

Kim does not disclose a transmission mode determination processor operable for performing a moving average operation upon all synchronous addition data rows stored in said at least one of synchronous addition buffers of said synchronous addition buffer group, and for determining a transmission mode by detecting, with respect to a transmission mode to be received, a minimum value of the moving average operation and an address of the at least one synchronous addition buffers providing the minimum value as claimed in independent claim 1.

Kim also does not disclose a null position detector operable for detecting, in accordance with a transmission mode determined

in the transmission mode determination processor, a null symbol position from the address providing the minimum value of the moving average operation, and for generating a synchronous pulse at a start point of the null symbol position as claimed in independent claim 1.

Applicant respectfully submits that the mode determination unit 270 of Kim is different from the transmission mode determination processor 13A of the present invention because the transmission mode determination processor 13A of the present invention determines a transmission mode by detecting a minimum value of the moving average operation as described above.

Also, applicant respectfully submits that the null symbol length calculation unit 250 of Kim is different from the Null position detector 19 of the present invention because a null position detector 19 detects a null symbol position from the address providing the minimum value of the moving average operation as described above.

For these reasons, it is believed that Kim does not show or suggest the presently claimed features of the present invention. Applicant also submits that Nomura does not make up for the deficiencies in Kim.

Nomura relates to a null symbol position detecting method and a null symbol position detecting apparatus for detecting a null symbol from signals such as a DAB (Digital Audio Broadcast) signal for example and to a receiver for receiving such a signal including null symbols (see col. 1, lines 8-12).

Nomura discloses that in Fig. 1, the DAB receiver comprises an antenna 1, a front-end section (a receive and tune-in section) 2, an A/D converter 3, an I/Q demodulator 4, an automatic frequency controller (AFC) 5, a Fast Fourier Transform section (FFT) 6, a Viterbi decoder 7, an MPEG decoder 8, a D/A converter 9, an output terminal 10, a controller based on DSP (Digital Signal Processor) 11, a D/A converter 12, and a voltage-controlled crystal oscillator (VCXO) 13 (see col. 5, lines 28-38).

Nomura also discloses that the AFC 5, to which the null symbol position detecting method and apparatus, detects the position of the null symbol included in the received and tuned-in DAB signal and supplies the data obtained by this processing to the controller 11 (see col. 5, lines 54-59)

Nomura does not disclose a transmission mode determination processor operable for performing a moving average operation upon

all synchronous addition data rows stored in said at least one of synchronous addition buffers of said synchronous addition buffer group, and for determining a transmission mode by detecting, with respect to a transmission mode to be received, a minimum value of the moving average operation and an address of the at least one synchronous addition buffers providing the minimum value as claimed in independent claim 1.

Nomura also does not disclose a null position detector operable for detecting, in accordance with a transmission mode determined in the transmission mode determination processor, a null symbol position from the address providing the minimum value of the moving average operation, and for generating a synchronous pulse at a start point of the null symbol position as claimed in independent claim 1.

It is therefore respectfully submitted that Kim, Nomura, individually or in combination, do not teach, disclose or suggest the presently claimed invention and it would not have been obvious to one of ordinary skill in the art to combine these references to render the present claims obvious.

In view of foregoing claim amendments and remarks, it is respectfully submitted that the application is now in condition

for allowance and an action to this effect is respectfully requested.

If there are any questions or concerns regarding the amendments or these remarks, the Examiner is requested to telephone the undersigned at the telephone number listed below.

Respectfully submitted,

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